Local anaesthetic inguinal hernia repair performed under supervision: early and long-term outcomes

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ABSTRACT

INTRODUCTION Local anaesthetic inguinal hernia repair may be technically demanding. There are minimal data regarding the outcomes of local anaesthetic hernia repair by trainees in comparison with consultants.

PATIENTS AND METHODS All consecutive local anaesthetic repairs performed by trainees and one consultant over a 9-year period were reviewed. Operation time, volume of local anaesthetic used, early and long-term complications were assessed. A postal survey was conducted to assess chronic groin pain and satisfaction rates.

RESULTS A total of 369 repairs were reviewed of which 265 repairs were performed by the consultant and 104 by trainees. The male-to-female ratio was 25:1 and the median age of the study group was 61 years (range, 18–93 years). The volume of local anaesthetic used was significantly higher for trainees than the consultant (42 ml versus 69 ml; $P = 0.03$). The operative time for the consultant and the trainees was 35 min and 40 min ($P = 0.8$). The day-case rate was higher for the consultant than the trainees (84% versus 69%; $P = 0.02$). Three patients operated by trainees required conversion to a general anaesthetic repair. No difference was noted in chronic groin pain (consultant 28% versus trainees 32%; $P = 0.52$) on the postal survey. The median follow-up was 5 years (range, 2–7 years).

CONCLUSIONS Local anaesthetic inguinal hernia repair can be performed safely by surgical trainees under consultant supervision with minimal short- and long-term morbidity. A large volume dilute solution of Lignocaine and Marcaine is recommended when hernia repair is undertaken by trainees.

KEYWORDS

Inguinal hernia – Training – Local anaesthesia

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Introduction

Inguinal hernia repair is one of the most common surgical procedures world-wide.¹ Lichtenstein repair has been the mainstay for repair of inguinal hernia in the last two decades and is the most frequently used technique.² Long-term outcomes (recurrence and chronic groin pain) following Lichtenstein repair are multifactorial; however, the operating surgeon is an important determinant.³ In addition, a local anaesthetic inguinal hernia repair is technically more demanding and may influence the long-term recurrence rates.⁴ With adequate supervision, results comparable to consultants have been achieved when operated by trainees for colorectal surgery,⁵ upper gastrointestinal surgery⁶ and pancreatic surgery.⁷ This study aimed to compare the outcomes following local anaesthetic inguinal hernia repair by a consultant and surgical trainees supervised by a

consultant and early complications and long-term outcomes were assessed.

Patients and Methods

All consecutive local anaesthetic inguinal hernia repairs performed by trainees and one consultant over a 9-year period were reviewed retrospectively. The operating surgeons were one consultant and surgical trainees. Indications for surgery were indirect inguinal hernias and symptomatic direct inguinal hernias. Surgery was also offered where there was difficulty in differentiating direct and indirect hernias. No patients who requested hernia repair were denied surgery. The patients were grouped into different ASA grades prior to surgery based on the co-morbidity of the patient. The patients were offered the choice of local anaesthetic or general anaesthetic at their out-patient's appointment. The only

absolute indication for surgery to be performed as an in-patient was if the patients were living alone. The local anaesthetic procedure was explained to the patient by the operating surgeon. ASA grades 1 and 2 patients underwent surgery under pulse oximetry monitoring. For ASA grades 3 and 4, patient's surgery was performed in the presence of an anaesthetist. No intravenous sedation was used for supplemental analgesia during the local anaesthetic procedure.

None of the surgical trainees had any previous experience of performing local anaesthetic inguinal hernia repair. Trainees were independently performing inguinal hernia repairs under general anaesthesia prior to performing local anaesthetic inguinal hernia repair. All the procedures performed by the trainees were supervised by the consultant scrubbed in theatre.

Local anaesthetic mixture

A high-volume anaesthetic mixture was designed in conjunction with the pharmacy department in the senior author's (AW) hospital.⁸ The anaesthetic mixture consisted of: 20 ml of 2% Lignocaine with 1:200,000 adrenaline (Hameln, UK), 30 ml of 0.5% Bupivacaine with 1:200,000 adrenaline (Astrazeneca, UK) and 50 ml of 0.9% saline.

This results in a total volume of 100 ml (400 mg of Lignocaine and 150 mg of Bupivacaine based on a 70-kg man). (The maximum dose of Lignocaine with adrenaline is 7 mg/kg, and of Bupivacaine with adrenaline is 3mg/kg). To buffer the Lignocaine, 6 ml of 8.4% sodium bicarbonate (Fresenius, UK) was added, giving a pH of 7.0.

Surgical technique

In the anaesthetic room, approximately 20 ml of the local anaesthetic mixture was infiltrated along the line of incision in the subcutaneous plane, around the pubic tubercle and the deep ring. A skin and external oblique aponeurosis incision was then performed, after which subaponeurotic infiltration of the mixture deep to the external oblique layer was undertaken. Further infiltration was performed into the spermatic cord avoiding the testicular vessels, nerves and the vas deferens. The sac was either reduced or excised according to the surgeon's preference and mesh repair was performed. The mesh repair techniques employed were Lichtenstein repair,⁹ PHS repair¹⁰ and mesh plug repair with onlay mesh. In patients with a large defect and a wide internal ring, a combination of mesh and mesh plug were used. The mesh plug was fashioned from a flat polypropylene mesh (6 cm × 11 cm); the shape of the mesh plug was maintained by a 1 nylon suture placed through the mesh about 1 cm away from the apex of the mesh plug. The plug was then placed in the internal ring and fixed to the margins using a single 1 nylon stitch.

The early outcome measures were operation time, volume of local anaesthetic used, early complications, day-case rates,

and re-admission. Long-term outcome measures were chronic groin pain and recurrence. All patients were reviewed in the out-patient department at 6 weeks to assess early complications and at 6 months to rule out recurrent herniation. Data regarding long-term recurrence were obtained by case note review and general practitioner records. In addition, a postal questionnaire survey was performed to assess chronic groin pain and satisfaction rates. Chronic groin pain was defined as pain in the groin for more than 6 months after the surgery. Patients were asked if they had any groin pain currently. They were also asked if groin pain changed their attitude towards undergoing surgery under local anaesthesia.

Statistical analysis

Statistical analysis was performed using SPSS software (SPSS Inc., Chicago, IL, USA). Continuous variables were compared using Student's *t*-test and categorical variables were compared using chi-squared test, as appropriate. *P*-values < 0.05 were considered statistically significant.

Results

A total of 369 local anaesthetic repairs were performed during the study period of which 265 (72%) procedures were performed by the consultant and 104 (28%) procedures by trainees. The male-to-female ratio was 25:1 and the median age of the study group was 61 years (range, 18–93 years). The median follow-up was 5 years (range, 2–7 years). The demographics of the patients and ASA (American Society of Anesthesiologists) grading were similar between the two groups (Table 1). Ninety (24%) patients in the study group were overweight (*n* = 65; body mass index [BMI] ⇒ 25 and < 30 kg/m²) or obese (*n* = 25; BMI > 30 kg/m²). Majority of the Prolene Hernia System mesh repairs were performed by the consultant compared to trainees (65 versus 5; *P* =

Table 1 Patient demographics in the two groups

	Consultant (<i>n</i> = 265)	Trainee (<i>n</i> = 104)	<i>P</i> -value ^a
Age (years)	64 (19–93)	60 (18–89)	0.8
BMI (kg/m ²)	26 (19–34)	25 (18–37)	0.7 ^b
Direct hernia	80 (31%)	31 (31%)	1
Indirect hernia	183 (69%)	72 (69%)	1
Both	2 (1%)	1 (1%)	1
ASA 1 & 2	175 (66%)	68 (65%)	0.90
ASA 3 & 4	90 (34%)	36 (35%)	0.90

^aChi-squared test unless indicated otherwise; ^bStudent's *t*-test.

Table 2 Intra-operative findings, early and long-term complications

	Consultant (<i>n</i> = 265)	Trainee (<i>n</i> = 104)	<i>P</i> -value ^a
Lichtenstein repair	192 (72%)	96 (92%)	0.0001
Prolene Hernia System mesh repair	65 (25%)	5 (5%)	0.0001
Mesh and mesh plug repair	8 (3%)	3 (3%)	1
Operating time (min)	35 (15–55)	40 (25–50)	0.80 ^b
Volume of local anaesthetic used (ml)	42 (25–100)	69 (25–95)	0.03 ^b
Haematoma	10 (4%)	5 (5%)	0.76
Urinary retention	2 (1%)	1 (1%)	1
Wound infection	3 (1%)	2 (2%)	0.62
Re-admission	7 (2.5%)	3 (3%)	1
Day-cases	222 (84%)	72 (69%)	0.02
Conversion	0	3 (3%)	0.02
Chronic groin pain	74 (28%)	33 (32%)	0.52
Recurrence	2 (0.7%)	2 (1.9%)	0.31

^aChi-squared test unless indicated otherwise; ^bStudent's *t*-test.

0.0001), whilst more Lichtenstein repairs were performed by trainees ($P = 0.0001$). The volume of local anaesthetic used was higher for trainees (42 ml versus 69 ml; $P = 0.03$). The day-case rate was higher for the consultant than the trainees (84% versus 69%; $P = 0.02$). No significant difference was noted between the two groups with regards to early complications and re-admission (Table 2). Four recurrences were noted during follow-up. All recurrences were noted within the first 6 months of surgery. The overall recurrence rate was 1%. Three patients undergoing surgery by trainees required conversion to a general anaesthetic repair because of patient discomfort, compared to no conversions when performed by the consultant ($P = 0.02$).

There was a 65% response rate to the postal questionnaire survey. No significant difference was noted between the consultant and trainees with regards to chronic groin pain (28% versus 32%; $P = 0.52$) and satisfaction rate on the postal survey. Overall, 97% of patients in the consultant group and 93% of patients in the trainee group were highly satisfied with the procedure and would consider inguinal hernia repair under local anaesthesia if needed on the opposite side.

Discussion

Inguinal hernia repair is generally considered an ideal training operation for junior surgeons with a combination of low mortality and appropriate technical difficulty. A local anaesthetic inguinal hernia repair is technically more demanding and may be associated with higher recurrence

rates.^{4,11} The present study where a third of the procedures were performed by trainees under consultant supervision has shown that results comparable to consultant can be achieved for inguinal hernia repair performed under local anaesthesia. There are conflicting reports in the literature regarding the outcome of hernia repair for trainees.^{12–15} Low recurrence rates have been achieved under general anaesthesia when hernia repair was performed by unsupervised senior trainee;¹⁵ however, a local anaesthetic repair performed by trainees was associated with higher recurrence rates.^{12,14} The current study has achieved low recurrence rates for both grades of surgeons with good patient satisfaction.

Several randomised^{16–18} and retrospective¹⁹ studies have shown that inguinal hernia repair under local anaesthesia is superior to regional and general anaesthesia in terms of shorter postoperative stay, reduced analgesic requirement and low cost. Data from the Swedish Hernia Register²⁰ have shown local anaesthesia is being used increasingly for repair of inguinal hernia, although the UK experience has been otherwise.²¹ One of the main concerns of trainees undertaking local anaesthetic inguinal hernia repair is the low volume of local anaesthetic solution for infiltration especially in overweight patients. The local anaesthetic solution used in the present study was a high-volume mixture of 100 ml designed in conjunction with the pharmacy department. The median volume of mixture used in the study was 60 ml although higher volumes were used by trainees. There is a perceived difficulty in performing local anaesthetic inguinal hernia repair in obese patients.²² In the

present study, 25% of the patients were either overweight or obese. There were no instances in the study where there was paucity of local anaesthetic mixture even in obese patients requiring conversion to a general anaesthetic repair in either group. The three conversions noted in the trainee group were secondary to patient anxiety and not due to lack of volume of local anaesthetic. The day-case rates were higher in the consultant group. This may be secondary to the experience of the senior surgeon; nonetheless, the majority of the cases in the trainee group were performed as day-cases.

The current UK Government targets recommend 75% day-case for inguinal hernia repair.²⁵ Our previous experience has suggested that a local anaesthetic inguinal hernia repair improves day-case rates.¹⁹ Inguinal hernia repair is, and should remain, an operation performed by trainees, and more and more local anaesthetic inguinal hernia repairs should be encouraged to be performed by trainees. The learning curve for a local anaesthetic repair has been shown to be short (6 cases)¹⁰ and there seems little doubt, from the present study, that close supervision for a local anaesthetic inguinal hernia repair by an experienced senior surgeon enhances the results achieved by trainees.

Conclusions

The current study has shown that primary inguinal hernia repair under local anaesthetic can be performed safely by supervised surgical trainees with results comparable to those of an experienced consultant. Trainees tended to use a greater volume of local anaesthetic solution; therefore, a large volume dilute solution of Lignocaine and Marcaine is recommended when hernia repair is undertaken by trainees.

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